



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/081,046	02/20/2002	Hardayal Singh Gill	SJ09-2001-0142/11758	2452

33224 7590 03/22/2004

INTERNATIONAL BUSINESS MACHINES CORPORATION
5600 COTTLE ROAD, DEPT. L2PA/010
INTELLECTUAL PROPERTY LAW
SAN JOSE, CA 95193-0001

EXAMINER

MAGEE, CHRISTOPHER R

ART UNIT	PAPER NUMBER
----------	--------------

2653

DATE MAILED: 03/22/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/081,046

Applicant(s)

GILL, HARDAYAL SINGH

Examiner

Christopher R. Magee

Art Unit

2653

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 08 January 2004.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-23 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 6,13 and 17 is/are allowed.
- 6) ☒ Claim(s) 1-5,7-12,14-16 and 18-23 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 20 February 2002 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date <u>6</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Response to Amendment

- The reply filed 01/08/2004 was applied to the following effect: All relevant objections are withdrawn as being satisfied.

- The indicated allowability of claim 13 is withdrawn in view of the reference(s) to Hasegawa '338. Rejections based on the cited reference(s) follow.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

1. Claims 1-4, 7-15, 18, 19 and 21-23 are rejected under 35 U.S.C. 102(e) as being anticipated by Hasegawa et al. (hereinafter Hasegawa) (US 6,496,338).

- Regarding claims 1, 7, 18 and 21-23, Hasegawa shows a magnetoresistance sensor structure comprising:

a magnetoresistance sensor having a sensor surface plane and comprising of a free layer 44;

a lower antiferromagnetic layer 42, and

an upper antiferromagnetic layer 46 overlying at least a portion of the free layer 44; and

Art Unit: 2653

an upper ferromagnetic layer 47 overlying and contacting at least a portion of the upper antiferromagnetic layer 46 on a contact face lying parallel to the sensor surface plane, so that the upper antiferromagnetic layer 46 lies between the upper ferromagnetic layer 47 and the free layer 44 (Fig. 3).

- Regarding claims 2 and 8-10, Hasegawa teaches the upper antiferromagnetic layer is PtMn (col. 7, lines 48-51) and the upper ferromagnetic layer is CoFe (col.11, lines 28-33).

- Regarding claims 3, 11 and 19, Hasegawa discloses that the magnetoresistive sensor is a giant magnetoresistance sensor (col. 1, lines 20-26).

- Regarding claims 4 and 12, Hasegawa shows an upper antiferromagnetic layer and an upper ferromagnetic layer overlie a first portion of the free layer that is less than all of the free layer, and further including a cap layer overlying a second portion of the free layer (Fig. 5).

- Regarding claim 13, Hasegawa shows a magnetoresistance sensor structure comprising:
a magnetoresistance sensor having a sensor surface plane and comprising of a free layer 44;

a lower antiferromagnetic layer 42, and

an upper antiferromagnetic layer 46 overlying at least a portion of the free layer 44; and

an upper ferromagnetic layer 47 overlying and contacting at least a portion of the upper antiferromagnetic layer 46 on a contact face lying parallel to the sensor surface plane, so that the upper antiferromagnetic layer 46 lies between the upper ferromagnetic layer 47 and the free layer 44 (Fig. 3); and

a cap layer overlying a second portion of the free layer (Fig. 5).

Art Unit: 2653

- Regarding claims 14 and 15, Hasegawa shows an upper antiferromagnetic layer and an upper ferromagnetic layer overlie a first portion of the free layer that is less than all of the free layer, and further including a lead layer 48 overlying the upper ferromagnetic layer 47 (Fig. 3) including a cap layer overlying a second portion of the free layer (Fig. 5).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 5, 16 and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hasegawa et al. (hereinafter Hasegawa) (US 6,496,338), as applied to claims 1, 7 and 18 above, and further in view of Gill (US 6,052,263).

- Regarding claims 5, 16 and 20, Hasegawa discloses all the features except the magnetoresistance sensor being a tunnel magnetoresistance sensor.

Gill '263 discloses that another type of magnetic device is a magnetic tunnel junction (MTJ) sensor (col. 2, lines 8-11).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to produce the magnetoresistance sensor of Hasegawa as a magnetic tunnel junction (MTJ) sensor as taught by Gill '263.

Art Unit: 2653

The rationale is as follows: One of ordinary skill in the art at the time of the invention would have been motivated to produce the magnetoresistance sensor of Hasegawa as a magnetic tunnel junction (MTJ) sensor as taught by Gill '263 so that the thermal stability of the sensor can be improved by using the high coercivity magnetic materials (Gill; col. 3, lines 36-38).

Allowable Subject Matter

Claims 6 and 17 are allowed.

The following is a statement of reasons for the indication of allowable subject matter:

- **Claims 6 and 17** specify a magnetoresistance sensor structure, which requires:

"an upper antiferromagnetic layer overlying substantially all the free layer" and "a cap layer overlying the upper ferromagnetic layer."

Hasegawa '338 shows an upper antiferromagnetic layer 46 overlying a portion of the free layer 44 but does not teach or suggest an upper antiferromagnetic layer overlying substantially all the free layer and a cap layer overlying the upper ferromagnetic layer as claimed in the present invention.

Response to Arguments

Applicant's arguments filed 01/08/2004 have been fully considered but they are not persuasive.

First, Applicant asserts on page 12:

"Thus, the antiferromagnetic layer does not overlie a portion of the free layer as claimed in the Applicant's invention, but only covers the sides of the free layer."

The Examiner maintains that Figure 3 of Hasegawa '338 clearly illustrates an upper antiferromagnetic layer 46 overlying at least a portion of the free layer 44 as claimed in the

Art Unit: 2653

present invention. Using Merriam-Webster's definition of overlie: to lie over or upon, the antiferromagnetic layer 46 lies over a portion of the free layer 44 as shown.

Therefore, the rejection of claims 1, 7 and 18 is maintained.

Second, in response to applicant's argument on page 14:

"As discussed above with respect to the section 102 (e) rejection of claims 1, 7 and 18, the Hasegawa reference fails to teach or suggest an upper antiferromagnetic layer overlying at least a portion of a free layer as claimed in claims 1, 7, and fails to teach or suggest an antiferromagnetic layer lying between an upper ferromagnetic layer and a free layer or a magnetoresistance sensor as claimed in claims 1 and 18, since the reference only discloses a ferromagnetic layer and an antiferromagnetic layer that abut the sides of the free layer. The Gill reference teaches a magnetic tunnel junction sensor, but is silent with respect to an upper antiferromagnetic layer overlying at least a portion of a free layer and an antiferromagnetic layer lying between an upper ferromagnetic layer and a free layer of a magnetoresistance sensor."

Regarding the §102 (e) rejection of claims 1, 7 and 18, Figure 3 of Hasegawa '338 demonstrates, *supra*, an upper antiferromagnetic layer 46 overlying at least a portion of the free layer 44 as claimed in the present invention.

Therefore, the rejection of claims 5, 16 and 20 is upheld.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Christopher R. Magee whose telephone number is (703) 605-4256. The examiner can normally be reached on M-F, 8: 00 am-5: 30 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, William Korzuch can be reached on (703) 305-6137. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Art Unit: 2653

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Christopher R. Magee
Patent Examiner
Art Unit 2653

March 19, 2004



WILLIAM KORZUCH
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2600